

May 13, 2010



Michigan's Roads: The Cost of Doing Nothing and the Rewards of Bold Action

Commissioned by:
The Michigan Chamber of Commerce

Prepared by:
Alex L. Rosaen
Caroline M. Sallee
Justin Eli

With Foreword By Patrick L. Anderson

Anderson Economic Group, LLC
1555 Watertower Place, Suite 100
East Lansing, Michigan 48823
Tel: (517) 333-6984
Fax: (517) 333-7058

www.AndersonEconomicGroup.com

Table of Contents

<i>Foreword by Patrick L. Anderson</i>	<i>i</i>
<i>I. Executive Summary</i>	<i>1</i>
Report Purpose	1
Net Economic Impact Defined	1
Investment Scenarios Defined	1
Overview of Findings	2
About Anderson Economic Group	5
<i>II. Michigan's Roads and the Michigan Transportation Fund</i>	<i>6</i>
Michigan's State Trunkline Roads	6
Funding for Michigan's Road Infrastructure	8
Michigan Transportation Fund, History and Future	9
Condition of Michigan's Roads	11
<i>III. Economic Impact of Road Construction</i>	<i>15</i>
Scope of Analysis	15
Three Possible Courses of Action	15
Two Scenarios: Do Nothing, or Bold Action?	16
Employment Impact Analysis	17
<i>IV. Importance of Roads to Key Michigan Industries</i>	<i>19</i>
Michigan Tourism and Road Infrastructure	19
Michigan Agriculture and Road Infrastructure	23
Michigan Manufacturing and Road Infrastructure	25
<i>V. Road Infrastructure's Impact on Michigan Households</i>	<i>27</i>
Impact of Road Conditions on Safety of Residents	27
Reductions in Wealth due to Poor Road Conditions	27
<i>Appendix A. Methodology</i>	<i>A-1</i>
<i>Appendix B: About the Authors</i>	<i>B-1</i>

Foreword by Patrick L. Anderson

Ever since Michigan became a State, our citizens have relied upon the State government to construct and maintain a network of roads. Roads are necessary for commerce, for convenience, for recreation, and for civic and religious activities. Indeed, to ensure that roads are adequately funded and that road funding is used solely for its intended purpose, our citizens have adopted into our Constitution special provisions requiring gasoline taxes to be spent on the maintenance of roads.

Today, we rely upon our major roads for commerce as much as we did 100 years ago. Indeed, all three of our largest industries—manufacturing, agriculture, and tourism—depend on our road network. Even in the Internet age, products and people move around by road.

That road network in Michigan has become sorely frayed. In this analysis, my colleagues at Anderson Economic Group have compared the employment effects of two courses of action: leaving our highway funding where it has been for the past decade, and taking bold action to improve it. For each case, we took into account the costs (including the cost of higher gas taxes) as well as quantified some of the benefits.

The results of this analysis are clear: the benefits to the state and its residents of increasing our road funding and improving our roads are very large, and far offset the cost of the higher gas taxes necessary to support that expenditure. One reason for this dramatic benefit is the additional highway funding Michigan would receive from the US Government, which would match much of the additional state tax revenue. However, this is only one benefit, and we demonstrate in this analysis that the State would be poorer if it adopted a policy of simply matching federal funds. While this “cold patch” approach may sound appealing, it makes no sense for the future of Michigan to manage our infrastructure on the basis of a formula adopted by the US Congress. Indeed, I personally find it difficult to believe that *any* formula created by the US Congress could fit the economic futures of 50 individual states, and roads are no exception!

As you read this report, I would call to your attention several compelling points:

- The demonstrable benefits for our three major industries, as illustrated in the maps showing how our highways directly support the key centers of agriculture, manufacturing, and tourism in Michigan.
- The large positive employment benefits of additional road funding, and the care taken to properly consider these benefits net of the costs of additional gas taxes.
- The additional benefits we did not consider, including: safety, reduced congestion, and the incentives of firms to locate here in the future. These, over time, could outweigh the direct employment benefits of better road funding.

Much of our state government is in need of reform, and our state's residents have suffered greatly during the Great Recession. Along with many of my fellow citizens, I have been urging our state's elected officials to address the state government's structural deficit and improve our state's business climate. As part of such of movement to turn our state around, the findings of this report show clearly that Michigan should also increase its road funding; that it should do so boldly; and should do so with its own future in mind.

Patrick L. Anderson is the Principal & CEO of Anderson Economic Group LLC, a Michigan-based consulting firm with offices in Chicago, East Lansing, and Los Angeles. Mr. Anderson is also the author of numerous articles and books, and was awarded the 2006 Leadership Michigan Distinguished Leadership award.

I. Executive Summary

REPORT PURPOSE

Constructing and maintaining basic infrastructure is one of the core functions of government. Investment in infrastructure, including roads and bridges, is important for enabling commerce and for the convenience, safety, and recreation of citizens.

The Michigan Chamber of Commerce commissioned this report to inform public discussion of the proper level of funding for building and maintaining Michigan's road infrastructure. This report describes Michigan's trunkline road system and the Michigan Transportation Fund (MTF); provides a credible, conservative estimate of the impact of several levels of funding on the state economy; discusses the impact that road infrastructure has on the safety and expenditures of Michigan households; and discusses the importance of our state trunkline roads to key Michigan industries.

NET ECONOMIC IMPACT DEFINED

Some of this report focuses on the economic impact of changes in expenditures for road construction and maintenance, so it is important to define the concept of "net economic impact." As detailed in "Michigan's Roads and the Michigan Transportation Fund" on page 6 of this report, road infrastructure and maintenance is paid for by the Michigan Transportation Fund, which is primarily funded by taxes on fuels and motor vehicle registration fees.

Our *net* measure of economic impact accounts for potential alternative uses for the money spent on infrastructure investment, so that only *bona fide* new economic activity is counted. This report focuses on employment as an indicator of how economic activity benefits Michigan's residents. Our conservative approach quantifies the impact of road construction and maintenance net of any foregone employment in other parts of the economy due to changes in taxes and fees.

INVESTMENT SCENARIOS DEFINED

The construction and maintenance of Michigan's road infrastructure is paid for in part by federal, state, and local funds. Federal funding of state and local road projects is awarded on a project-by-project basis, contingent upon local funds being provided to "match" the federal funds. Under the federal SAFETEA-LU¹ law, the State of Michigan was appropriated approximately \$1.2 billion for all transportation projects (including road projects, but also including other trans-

1. SAFETEA-LU stands for the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users. While transportation funding has been planned in six year increments under this law, as of this report's publication date, federal funding under this law has been operating on temporary extensions of as little as 1 month since it expired on September 30, 2009.

portation projects).² Under the Governor's proposed budget for FY 2011, the state will provide matching funds at a level that would not allow all of the federal funds for which Michigan is eligible to be allocated to Michigan projects. The Michigan Department of Transportation (MDOT) estimates that \$475 million in federal funds are at stake if the MTF does not provide the necessary amount of matching funds.

Our analysis takes as its baseline that the State of Michigan's government will take the necessary action to match all of the federal funds available for Michigan road construction projects. While this level of funding is not provided by the Governor's proposed budget, Michigan has never failed to receive all of the federal road funds for which it is eligible. Our analysis then estimates the employment impact from two scenarios deviating from that baseline:

1. The "Do Nothing" Scenario: The state government takes no action to ensure it receives all federal road funds for which it is eligible. This corresponds to an MTF funding level of \$1.8 billion for FY 2011, compared to a baseline of \$2.19 billion.
2. The "Bold Action" Scenario: The state goes beyond simply matching available federal funds and invests at a level consistent with the 2008 Transportation Funding Task Force report's "Better" investment scenario. This corresponds to an MTF funding level of \$4.37 billion for FY 2011, compared to a baseline of \$2.19 billion.

OVERVIEW OF FINDINGS

1. Doing Nothing Risks Forfeiting \$475 Million in Federal Funds.

The Michigan Department of Transportation estimates that an MTF funding level of \$1.8 billion would result in the state losing its claim on approximately \$475 million in federal transportation funding that is reserved for State of Michigan road projects under the federal SAFETEA-LU law.

2. Doing Nothing Would Cost the State 12,000 Jobs. Bold Action on Road Construction Would Create An Additional 15,000 Jobs.

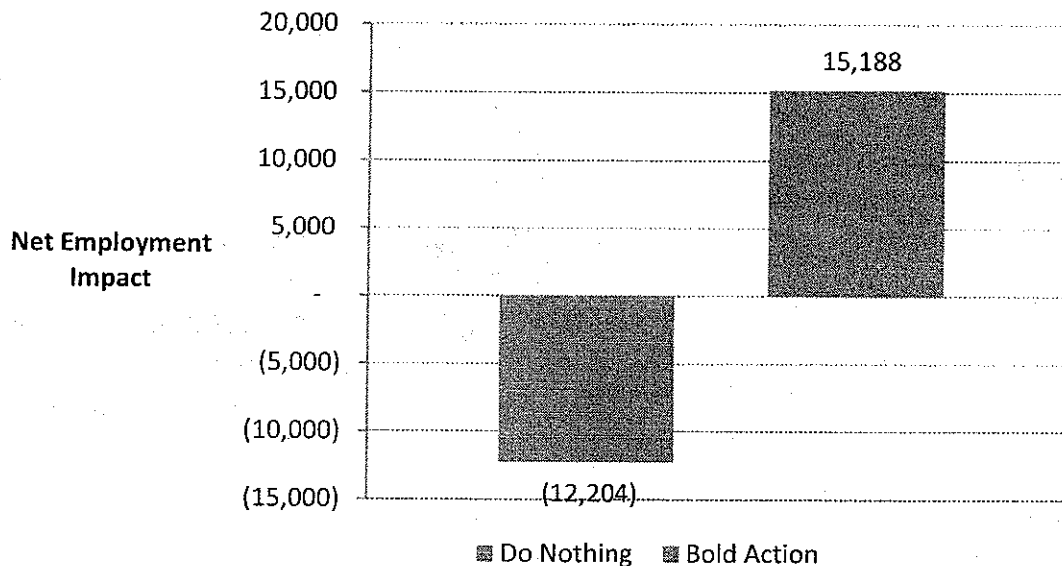
We estimated the net employment impact of "Doing Nothing" and "Bold Action" by comparing the results of the results of two funding levels to a baseline. Our analysis accounts for the direct and indirect employment associated with the construction and maintenance of Michigan's trunkline roads.

Figure 1 on page 3 shows the net change in jobs in Michigan if the state government does nothing and forfeits federal funds, and if it takes bold action and funds the MTF beyond the level required to maximize federal funds. These

2. Most local expenditures on road construction and maintenance are funded through the Michigan Transportation Fund, so the level of funding in the MTF affects both state and local spending.

results take into account alternative uses for MTF funds by households and businesses.

FIGURE 1. Net Employment Impact Compared to Matching All Available Federal Road Funds, FY 2011



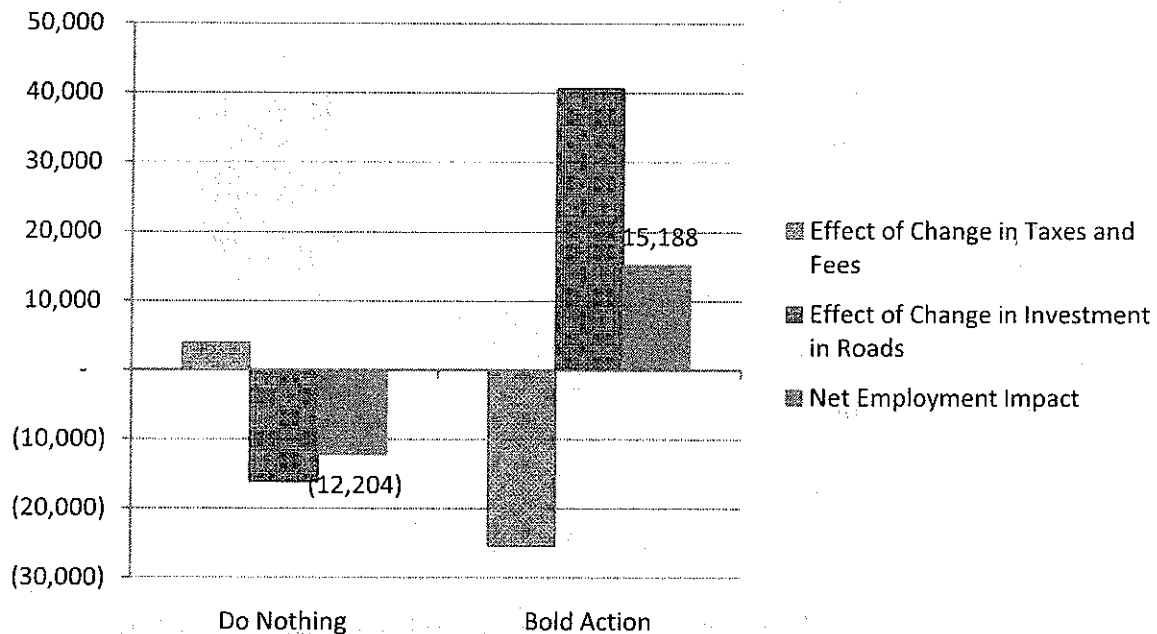
We estimate that failing to raise the funds to match federal transportation funding of road construction and maintenance would cost over 12,000 jobs in Michigan, as shown in Figure 2 below. This includes over 15,000 direct and indirect jobs that would have been created due to road construction and maintenance. It also accounts for the estimated 3,000 jobs saved due to lower levels of the taxes and fees that fund the Michigan Transportation Fund.

We estimate that "Bold Action" (doubling the state's investment in road and bridge infrastructure over the level needed to match federal funds) would create over 15,000 jobs in Michigan compared to simply maximizing federal funding for road construction, as shown in Figure 2 on page 4. This includes over 34,000 direct and indirect jobs created due to road construction and maintenance. It also accounts for the estimated 19,000 jobs lost due to lower levels of spending by households and businesses in the state from additional taxes and fees that fund the Michigan Transportation Fund. These 15,000 net new jobs are *in addition to* the job losses averted by not pursuing the "Do Nothing" funding scenario.

Note that these estimated employment impacts only include the benefits of employment in road construction and maintenance, and do not quantify the benefits of improved safety, reduced congestion, more reliable transportation of goods by industry, or other benefits of improved road conditions. Such addi-

tional benefits would be particularly pronounced under the “Bold Action” investment scenario.

FIGURE 2. Employment Impact of Road Construction, Transportation Taxes and Fees, and Total Net Impact



3. Well-Maintained Road Infrastructure Is Critical to the Success of Key Michigan Industries.

Manufacturing, agriculture, and tourism are important industries in connecting the State of Michigan’s economy to the rest of the country and the world. Section 3 of this report shows how employment and production in these industries depend on Michigan’s main highways. The section also discusses how delays from accidents, excess construction do to poor maintenance, and other traffic bottlenecks affect these industries.

4. Michigan Households Experience More Vehicle Accidents and Pay More for Medical Care and Vehicle Repairs Because of Michigan’s Road Conditions.

Poor road conditions in the state cost households in terms of safety, medical costs, damage to vehicles, and road congestion. In “Road Infrastructure’s Impact on Michigan Households” on page 27, we identify several reports that support and quantify these claims. We also extend these reports’ methodologies

to provide more detailed information on the likely costs to Michigan households. In particular, we estimate that:

- The cost of vehicle repairs due to crashes involving poor road infrastructure was \$542 million in Michigan in 2006.
- Medical costs involving poor road infrastructure resulted \$3,763 in medical costs per crash in Michigan.
- The cost of highway congestion (both fuel costs and the value of time wasted) for Michigan was \$2.9 billion in 2007, or \$287 per person.

ABOUT ANDERSON ECONOMIC GROUP

Anderson Economic Group, LLC is a consulting firm that specializes in economics, public policy, financial valuation, market research, and land use economics. With offices in East Lansing, Chicago, and Los Angeles, Anderson Economic Group has completed economic and fiscal impact studies for a variety of public and private sector clients. See "Appendix B: About the Authors" on page B-1.

II. Michigan's Roads and the Michigan Transportation Fund

This section briefly describes the State of Michigan's trunkline road system; how the construction and maintenance of this system is funded; and the condition of Michigan's roads. This section is intended to provide context and motivation for the analysis of the importance of Michigan's trunkline roads for households and key industries in Michigan, and the economic impact analysis presented in later sections.

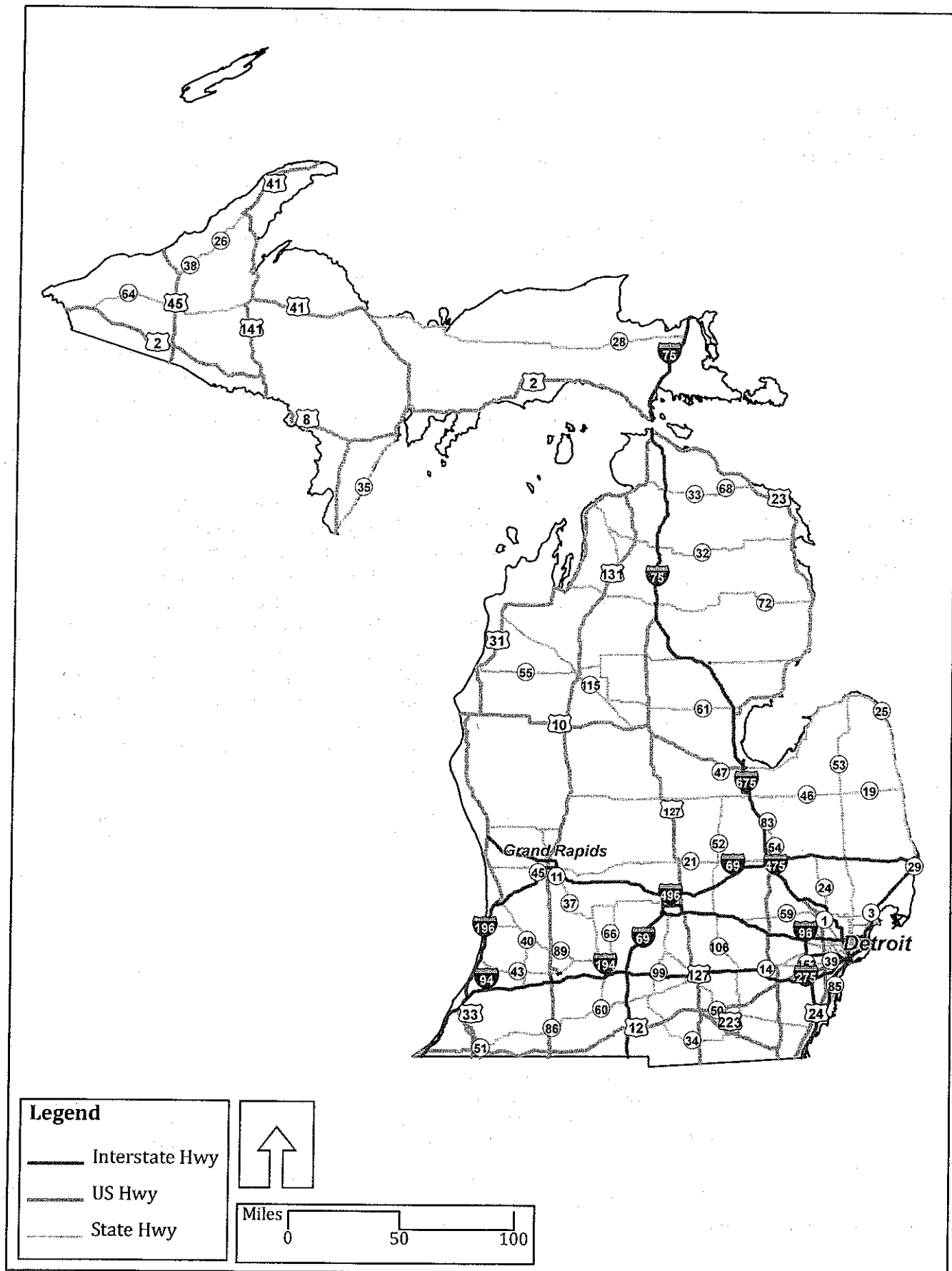
MICHIGAN'S STATE TRUNKLINE ROADS

Michigan's trunkline roads are the major roads that provide the highest-capacity connections between communities within the state and with other states. These roads include the state's interstate highways, and all US- and M- roads throughout the state. As described later in this section (see "Funding for Michigan's Road Infrastructure" on page 8), trunkline roads are constructed and maintained with state and federal funds directed by the state government. Other important roads in Michigan's road transportation system are constructed and maintained by governments at the county, city, and village level.

Figure 3 on page 7 shows Michigan's trunkline road system, which includes 9,695 miles of state highways as of 2005.³

3. Wilbur Smith Associates, "MI Transportation Plan, Moving Michigan Forward," Prepared for the Michigan Department of Transportation, March 2007.

Figure 3: Michigan's Trunkline Road System



Source: ESRI, Inc.

FUNDING FOR MICHIGAN'S ROAD INFRASTRUCTURE

Michigan's road and bridge infrastructure is constructed, maintained, and operated with funds from the federal government, the state government, county road commissions, and cities and villages. At the center of this funding system is the MTF, which is the source of all capital spending on roads and bridges by the state government on its trunkline road system. Allocations of MTF funds also account for a majority of the spending by counties, cities and villages, and provides the "matching funds" at the state and local levels that are required for Michigan's share of federal highway funds to be spent in the state.

Funds are typically spent in two ways: capital expenditures, and maintenance and operation expenditures. Capital expenditures are for creating, expanding, or modernizing transportation infrastructure. Maintenance expenditures are for repairing transportation infrastructure and include reconstruction, restoration, snow plowing, and patching. It should be noted that federal matching funds go only towards capital expenditures.

MICHIGAN TRANSPORTATION FUND, HISTORY AND FUTURE

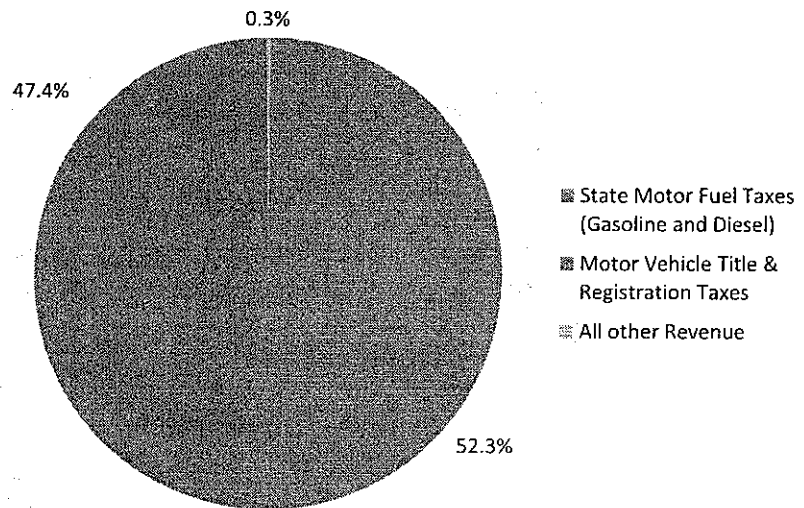
The Michigan Transportation Fund was established by Public Act 51 of 1951 (Act 51) as the primary fund for collecting and distributing transportation revenues. The MTF has received between \$1.8 billion and 1.9 billion in each of the last 5 years. This amount is over 6% of the total tax revenue collected by the State of Michigan, which was \$27.7 billion in FY 2008.⁴ Act 51 mandates how funds from the MTF are distributed. The main sources of revenue for the MTF are state motor fuel taxes and motor vehicle registration taxes.⁵ In FY 2008, state motor fuel tax revenue comprised 52% of all MTF revenue, while motor vehicle registration taxes comprised 47%. Note that revenue from the six percent sales tax on the price of gasoline and diesel fuel does not go to the MTF, but primarily goes to the State School Aid Fund as well as local government revenue sharing. See Figure 4 below.

The revenue from these taxes are "state restricted" or "earmarked" funds strictly for public transportation projects. The MTF does not collect nor distribute any money to Michigan's General Fund.

4. Michigan's Senate Fiscal Agency.

5. Michigan's two primary state fuel taxes are motor fuel taxes on gasoline and diesel fuels. The gasoline tax is currently 19 cents per gallon and is a fixed per gallon tax, and does not change with the price of gasoline. Michigan's diesel tax is also a fixed per gallon tax and is currently 15 cents per gallon of gasoline sold.

FIGURE 4. MTF Revenue by Fund Source, FY 2008



Source: House Fiscal Agency, Michigan Transportation Fund Revenue, FY 1997-2010
Analysis: Anderson Economic Group, LLC

Total MTF revenue has fallen every year from fiscal year 2006 to 2010 due to lower demand for fuel and the recent fall in demand for new vehicles. All sources of revenue have shown decreases in revenue since FY 2006; the largest decreases with respect to dollars have been in gasoline tax and motor vehicle registration revenue. See Table 1 below.

Michigan's Roads and the Michigan Transportation Fund

TABLE 1. Michigan Transportation Fund, Source of Revenue, FY 2006-2010

	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	% Change, 2006-2010
\$0.19/gal Gasoline Tax	\$906,221	\$883,688	\$848,864	\$831,000	\$821,000	-9.4%
\$0.15/gal Diesel Tax	\$148,599	\$143,806	\$140,096	\$131,000	\$131,000	-11.8%
Motor Vehicle Title & Registration Taxes	\$898,798	\$907,809	\$894,724	\$872,800	\$864,800	-3.8%
All other Revenue	\$14,301	\$8,133	\$5,885	\$3,023	\$3,100	-78.3%
Total Revenue	1,967,919	1,943,436	1,889,569	\$1,837,823	\$1,819,900	-7.5%

Note: Data in thousands. FY 2009 and 2010 are House Fiscal Agency estimates. "All other revenue" includes the liquid petroleum gas tax and interest/other.

Source: House Fiscal Agency, Michigan Transportation Fund Revenue Source and Distribution FY 1997-2010

Analysis: Anderson Economic Group, LLC

The distribution of MTF funds is mandated by Act 51. The revenue is first subject to various statutory deductions that include distributions for the Recreation Fund; Michigan Department of Transportation (MDOT) administrative costs; statutory grants (such as rail grade crossing and bridges); miscellaneous grants to other departments regarding transportation-related projects; the Economic Development Fund; and the Comprehensive Transportation Fund (CTF). Act 51 mandates that following statutory deductions, the CTF will receive 10% of MTF revenues. The remaining MTF balance is then distributed to the three government agencies that are responsible for the Michigan's transportation infrastructure.⁶

1. The state of Michigan, responsible for the state trunkline highways;
2. The 83 County Road Commissions, responsible for county roads; and the
3. 533 incorporated cities and villages, responsible for city/village streets.⁷

For all three agencies, MTF funds are primarily used for capital projects and routine maintenance. Moreover, MTF funds are their primary source to acquire

6. The distribution of the remaining MTF balance to the three entities is based on a distribution formula established in Act 51.

7. MDOT is responsible for the state's trunk highway system, which is comprised of "I," "M," and "US," labeled highways, making up nearly 9,700 route miles or 8% of the state's roadways.

The 83 road commissions, which manage county roads, are responsible for 88,960 route miles or 74% of the state's roadways.

The cities and villages are responsible for local streets, which make up for 20,914 route miles or 18% of Michigan's roadways.

See MDOT's State Long-Range Transportation Plan, 2005-2030, Highway/Bridge Technical Report, November 17, 2006.

federal matching funding, which generally ranges from 15% to 20% per capital project. Because of this, the current trend of decreasing MTF revenue will have an impact on all three agencies.

CONDITION OF MICHIGAN'S ROADS

Michigan's roads are not all in the same condition. While the majority of Michigan's roads in urban and rural areas are in "good" or "fair" condition, there is a growing number of roads that are in "poor" condition. We present the results of several studies that assess Michigan's road conditions below.

In order to measure road condition, we analyzed the Federal Highway Administration's International Roughness Index (IRI) data. This objective index measures pavement roughness in terms of the number of inches per mile that a laser jumps as it is driven across a road. The lower the score, the smoother the ride.⁸ The data that we used for this analysis are from 2004.

According to the IRI, a majority (over 50%) of Michigan's urban roads are in good or fair condition. The urban roads in the best shape are freeways and expressways (divided highways with two or more lanes for the exclusive use of through traffic in each direction). Over 85% of Michigan's urban interstate highways are also in good or fair condition. The roads that perform the worst on this measure are the principal arterial roads (smaller roads that serve traffic between major points) with almost 60% in good or fair condition. See Table 2 on page 12.

The condition of Michigan's urban roads is worse than that of its Midwest neighbors and the average U.S. state. Michigan is one of ten states with the highest percentage of urban lane miles scoring poorly on the IRI. As shown in Table 2 on page 12, 40.6% of Michigan's urban interstate lane miles were in good condition in 2004 compared to 50.4% of Midwestern states and 56.3% of urban interstate lane miles nationally.⁹ Michigan's freeway and expressways are in better condition than the other Midwestern states and similar to the condition of the average U.S. state. However, Michigan's other principal roads score lower on the IRI than the average U.S. state and other Midwestern states. In 2004, 59.2% of principal arterial roads were in good or fair condition compared to 73.6% nationally. See Table 2 below.

8. An IRI score of less than 95 means the road is in "good" condition, an IRI score between 95 and 170 means the road is in "fair" condition, and an IRI score over 170 means the road is in "poor" condition.

9. Interstate highways are limited access divided facilities of at least four lanes designated by the Federal Highway Administration as part of the Interstate System.

TABLE 2. Percentage of Urban Road Miles Meeting Various Roughness Standards,^a 2004

	Interstate			Freeways & Expressways			Other Principal Arterial Roads ^b		
	Good ^c	Good or Fair	Poor	Good	Good or Fair	Poor	Good	Good or Fair	Poor
Michigan	40.6%	87.0%	13.0%	47.5%	93.4%	6.6%	12.5%	59.2%	40.8%
Midwestern States (MWS) Average ^d	50.4%	93.5%	6.5%	40.1%	94.1%	5.9%	23.7%	73.6%	26.4%
US Average	56.3%	92.5%	7.5%	47.2%	90.2%	9.8%	27.0%	73.6%	26.4%
Percentage Point Difference (MI - MWS)	-9.8%	-6.5%	6.5%	7.4%	-0.6%	0.6%	-11.2%	-14.4%	14.4%
Percentage Point Difference (MI - US)	-15.7%	-5.5%	5.5%	0.3%	3.2%	-3.2%	-14.5%	-14.3%	14.3%

Source: Federal Highway Administration, Table HM-64, 2004; Anderson Economic Group, "Benchmarking for Success: A Comparison of State Infrastructure," commissioned by the Michigan House of Representatives, December 2006.

- Road conditions are measured using the International Roughness Index (IRI), an index that measures pavement roughness in terms of the number of inches per mile that a laser jumps as it is driven across a road. The lower the IRI, the smoother the ride.
- Arterial roads are major streets that allow travel between major points. Interstates, freeways, and expressways are divided roads that have multiple lanes going in one direction.
- AEG's road condition standards based on IRI are: Good roads: IRI < 95; Fair roads: 95 < IRI < 170; Poor roads: IRI > 170.
- Midwestern states include: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin.

With the exception of its interstate highways, Michigan's rural roads are in good condition compared to its peers. In 2004, 41.9% of Michigan's interstate highways in rural areas of the state were in good condition compared to 63.4% of the rural interstate highways in neighboring states and 72.2% nationally. In the other categories of roads, the major roads in rural areas (those that served the most traffic) were in better condition than the same types of roads in neighboring states and nationally. As shown in Table 3 on page 13, 97% of Michigan's principal arterial roads were in good or fair condition compared to 95.6% in the Midwestern states and 94.6% nationally. The same pattern holds for the minor arterial roads.

Michigan's Roads and the Michigan Transportation Fund

TABLE 3. Percentage of Rural Road Miles Meeting Various Roughness Standards,^a 2004

	Interstate			Other Principal Arterial Roads			Minor Arterial Roads ^b		
	Good ^c	Good or Fair	Poor	Good	Good or Fair	Poor	Good	Good or Fair	Poor
Michigan	41.9%	92.3%	7.7%	62.5%	97.0%	3.0%	66.5%	99.8%	0.2%
Midwestern States (MWS) Average ^d	63.4%	98.2%	1.8%	56.5%	95.6%	4.4%	49.2%	92.9%	7.1%
US Average	72.2%	98.0%	2.0%	56.8%	94.6%	5.4%	46.5%	92.7%	7.3%
Percentage Point Difference (MI - MWS)	-21.5%	-5.9%	5.9%	6.1%	1.4%	-1.4%	17.3%	6.9%	-6.9%
Percentage Point Difference (MI - US)	-30.3%	-5.7%	5.7%	5.7%	2.4%	-2.4%	20.0%	7.1%	-7.1%

Source: Federal Highway Administration, Table HM-64, 2004; Anderson Economic Group, "Benchmarking for Success: A Comparison of State Infrastructure," commissioned by the Michigan House of Representatives, December 2006.

- a. Road conditions are measured using the International Roughness Index (IRI), an index that measures pavement roughness in terms of the number of inches per mile that a laser jumps as it is driven across a road. The lower the IRI, the smoother the ride.
- b. Minor arterial roads are roads linking cities and larger towns in rural areas.
- c. AEG's road condition standards based on IRI are: Good roads: IRI < 95; Fair roads: 95 < IRI < 170; Poor roads: IRI > 170.
- d. Midwestern states include: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin.

As we mentioned above, the roughness analysis we conducted uses 2004 data. A report by the Michigan Transportation Asset Management Council using more recent data (2008) found that 32% of Michigan's federal-aid roads are in poor condition and that the number of roads being categorized as "poor" is growing rapidly. They found that the number of federal-aid-eligible roads in poor condition increased 7% between 2007 and 2008. Since 2004, the number of federal-aid roads in poor condition has tripled from 10.5% to 31.6%. Non-federal-aid roads fared worse with 43% in poor condition in 2008.¹⁰ Not all

10. See Michigan Transportation Asset Management Council, *Michigan's Roads and Bridges 2008 Annual Report*.

Michigan roads are in the same condition, but it appears that the number of roads classified as poor is increasingly rapidly, as shown in Table 4 on page 14.

TABLE 4. Michigan Road Pavement Conditions

Pavement Condition	Federal Aid Roads		Non-Federal-Aid Roads	
	2004	2008	2004	2008
Good	26.0%	19.4%	n/a	14%
Fair	63.5%	49.0%	n/a	43%
Poor	10.5%	31.6%	n/a	43%

Source: Michigan Transportation Asset Management Council, "Michigan's Roads and Bridges 2008 Annual Report"

Michigan has traffic volumes that are heavier than the average U.S. state for all urban roads. To measure congestion, we used the Volume Service Ratio (VSR), which measures the ratio of the observed volume of traffic to maximum traffic volume based on the number of lanes, speed limits, and access controls. A road with a VSR close to 1 indicates a road that is more likely to have traffic congestion. We classify roads with a VSR above 0.80 as congested. As shown in Table 5, 43.8% of Michigan's urban interstate highways had heavy traffic volumes in 2005 compared to the state average of 32.6%. The same pattern holds for Michigan's rural interstates. However, the other principal roadways in Michigan's rural areas are less congested than the state average. See Table 6 on page 15.

TABLE 5. Percentage of Urban Roads that Are Congested^a, 2005

	Interstate	Other Freeways & Expressways	Other Principal Arterials	Minor Arterials	Collector
Michigan	43.8%	29.6%	14.6%	12.9%	11.4%
U.S. State Average	32.6%	19.5%	10.9%	8.4%	6.2%
Percentage Point Difference (MI-US)	11.3%	10.1%	3.7%	4.5%	5.2%

Source: Federal Highway Administration, Table HM-61; Anderson Economic Group, "Benchmarking for Success: A Comparison of State Infrastructure," commissioned by the Michigan House of Representatives, December 2006.

- a. Road congestion is measured using the *Volume Service Ratio (VSR)*. The VSR is measured as the ratio of the observed volume of traffic to the maximum volume of traffic based on the number of lanes, speed limits, and access controls. We consider a road congested if the road has a VSR greater than 0.80.

TABLE 6. Percentage of Rural Roads that Are Congested, 2005

	Interstate	Other Principal Arterials	Minor Arterials	Major Collectors
Michigan	8.7%	2.0%	0.0%	0.0%
U.S. State Average	7.3%	2.5%	1.7%	0.3%
Percentage Point Difference (MI-US)	1.4%	-0.5%	-1.7%	-0.3%

Source: Federal Highway Administration, Table HM-61; Anderson Economic Group, "Benchmarking for Success: A Comparison of State Infrastructure," commissioned by the Michigan House of Representatives, December 2006.

III. Economic Impact of Road Construction

The construction and maintenance of road infrastructure provides economic benefits to the state in many ways, including providing employment in the state, and providing the broader benefits of a well-maintained road infrastructure system. This section focuses on a narrow but tangible slice of these benefits: the direct and indirect employment resulting from the construction and maintenance of Michigan's road and bridge infrastructure. Later sections address the importance to industry and to households of well-maintained road infrastructure.

SCOPE OF ANALYSIS

The scope of this employment impact analysis is limited to the effect of capital outlays of state and local governments through the Michigan Transportation Fund. This includes federal funds awarded through the expenditure of state and local "matching" funds required to allow federal highway funds to be invested in Michigan's interstate highways and major arterial roads. While local governments spend significant resources on the construction and maintenance of less-used roads, this report focuses on construction, reconstruction, regular operation, and routine maintenance of Michigan's trunkline and major arterial roads. This analysis does not include potential impacts of changes in incentives and behavior due to changes in taxes and fees, and does not address the signaling effects of the quality of Michigan's infrastructure in terms of business location decisions. The importance of high-quality infrastructure for several industries that are important to Michigan's economy are addressed in Chapter 3 of this report.

THREE POSSIBLE COURSES OF ACTION

In order to identify the costs and benefits of investing in road infrastructure we must be explicit about what level of funding we are analyzing. Below we describe three possible courses of action for the state's funding of the Michigan Transportation Fund, which provides the funds for the construction, maintenance, and operation of Michigan's trunkline roads and major arterial roads at the state and local levels.¹⁰ The three courses of action are:

- "Do Nothing." The state continues on its current trajectory of funding road construction, only with the existing per-gallon gas tax and motor vehicle title and registration fees. This corresponds to a FY 2010-11 Michigan Transportation Fund revenue total of \$1.8 billion.
- "Baseline." Change the current policies enough to leverage federal matching funds that the state currently risks losing. This corresponds to a FY 2010-11 Michigan Transportation Fund revenue total of \$2.19 billion.
- "Bold Action." Raise enough revenue to fund infrastructure repair and improvement at a level that would make road and bridge infrastructure an asset to Michigan's business climate. In our analysis we assume this is a funding level of

10. Michigan's cities and villages can choose to spend additional funds from their general budgets.

double the "Baseline" funding level, at a FY 2010-11 Michigan Transportation Fund revenue total of \$4.37 billion.¹¹

Each of these funding levels affects the amount of federal transportation funds awarded to the State of Michigan, as well as the amount of MTF funding that is allocated to county and local governments in the state, as discussed below. We use these funding levels as a basis for the employment impact of these scenarios.

TWO SCENARIOS: DO NOTHING, OR BOLD ACTION?

This report identifies the employment impact of two scenarios, each defined in relation to the "Baseline" MTF funding level described above (i.e. the investment level required to just match all federal highway funds available to the state and local governments). Michigan has so far funded road infrastructure at this level in each year but currently risks falling short. The scenarios, "Do Nothing" and "Bold Action," are described below.

The "Do Nothing" Scenario

A significant portion of Michigan's capital expenditures comes from the federal Department of Transportation. This funding is contingent on being "matched" by state and local funds, typically requiring 20% of a project to be funded by state and local money. The "Do Nothing" scenario addresses the impact of falling short of the state funds needed to match the maximum amount of federal road funds available to the state. As of this report's publication date, MDOT projects that \$475 million in federal highway money is at risk under current law due to state matching funds not being spent in fiscal year 2011.

Road construction projects funded by local governments can also be funded in part by federal money requiring matching local funds. As such, there is additional federal highway funding at risk at the local level, as county road commissions, cities, and villages may not have enough funds available to match federal funding for local projects. However, as of this report's publication date, MDOT, the House Fiscal Agency, and SEMCOG (the state's largest municipal planning organization) did not have estimates aggregating projections of local expenditures on road construction and maintenance. Nevertheless, since county road commissions, cities, and villages use funds disbursed from the MTF to match federal road funds, it is plausible to assume that a shortfall at the state level could be echoed by a shortfall at the local level. While the precise shortfall at each level of government is unknown for fiscal year 2010-11, this scenario is

11. Given Michigan's infrastructure needs and the desire of many in the state to become more economically competitive, state transportation officials could likely put to good use almost any amount of road infrastructure funding. We take as our benchmark here the Transportation Funding Task Force 2008 report "Better" funding scenario, which approximately doubled the level of state and local funding required to match all available federal funds.

representative of future years if Michigan remains on its current “do nothing” course with respect to MTF funding. This analysis assumes that local governments have the same proportion of federal matching funds at risk as the state government, though this will vary from community to community.

The “Bold Action” Scenario

A bold course of action consistent with a vision for world class road infrastructure in the state was identified in the Transportation Funding Task Force report presented to Governor Granholm in 2008. For this vision to be achieved, the task force estimated that the MTF would need to be funded at roughly twice the level needed to merely meet the federal matching requirements and no more. This level of funding would mean \$4.38 billion in MTF expenditures. Our analysis of this plan assumes an increase in taxes and fees to fund MTF expenditures on road infrastructure.

EMPLOYMENT IMPACT ANALYSIS

We estimate the change in employment due to changes in road infrastructure funding in the state using a rigorous and conservative methodology. Our economic impact methodology is based on the book *Business Economics and Finance* (2004, CRC Press) by Patrick L. Anderson, the founder and CEO of our company. Unlike many impact studies of this kind, we properly account for substitution: we identify the sources of funding for road infrastructure and estimate the effects of alternative uses of those funds.

We find that changes in the level of funding for Michigan’s road infrastructure affect employment in the state in two ways. First, federal transportation funds that are at risk if the state fails to match all available federal funds would generate employment with virtually no trade-offs, because federal funding comes from outside the state. This effect is an important reason why the cost of “Doing Nothing” is very high in terms of employment in the state, as shown below.

Second, state and local spending from in-state sources (mostly motor vehicle fees and taxes on fuels), are being redirected from spending with a lower employment multiplier than road construction and maintenance.¹² This effect is important in raising the cost of “Doing Nothing” and is the sole reason that “Bold Action” results in higher employment in the state.

Table 6 on page 18 shows the results of our analysis of “Doing Nothing.” We find that failing to raise the funds to match federal transportation funding of road construction and maintenance would result in less than 3,000 jobs saved due to lower levels of taxation, offset by a potential 15,000 direct and indirect

12. The relative size of such multipliers depends on many factors, including the size of the economic region, how labor-intensive the industry is, and how much of the materials and equipment used by the industry are sourced from within the region.

Economic Impact of Road Construction

jobs from road construction and maintenance lost. The net impact, then, of the "Do Nothing" scenario is over 12,000 potential jobs lost.

TABLE 6. Employment Impact of "Doing Nothing" on Road Infrastructure Investment (Compared to "Baseline")

Change in Employment (Direct and Indirect)		
Effect of Lower Taxes and Fees	Jobs Due to Change in Spending by Michigan Households	2,859
	Jobs Due to Change in Spending by Michigan Business	1,081
	Jobs Due to Change in Spending Outside Michigan	-
Effect of Lower Investment	Jobs Due to Change in Federal Spending on Road Infrastructure	(9,852)
	Jobs Due to Change in State and Local Spending on Road Infrastructure	(5,352)
	Jobs Due to Change in State and Local Spending on Other Items	(940)
Total Impact on Michigan Employment		(12,204)

Source: Anderson Economic Group, LLC

Table 7 below shows the results of our analysis of "Bold Action" on investment in road infrastructure. We find that doubling the state's investment in road and bridge infrastructure over the level needed to match federal funds would create over 34,000 direct and indirect jobs from road construction and maintenance. This is offset by about 19,000 jobs lost in Michigan due to the taxes and fees used to fund the Michigan Transportation Fund. The net result of the "Bold Action" investment scenario is the creation of over 15,000 direct and indirect jobs in Michigan.

TABLE 7. Employment Impact of "Bold Action" on Road Infrastructure Investment (Compared to "Baseline")

Change in Employment (Direct and Indirect)		
Effect of Higher Taxes and Fees	Jobs Due to Change in Spending by Michigan Households	(18,468)
	Jobs Due to Change in Spending by Michigan Business	(6,980)
	Jobs Due to Change in Spending Outside Michigan	-
Effect of Higher Investment	Jobs Due to Change in Federal Spending on Road Infrastructure	-
	Jobs Due to Change in State and Local Spending on Road Infrastructure	34,564
	Jobs Due to Change in State and Local Spending on Other Items	6,072
Total Impact on Michigan Employment		15,188

Source: Anderson Economic Group, LLC

IV. Importance of Roads to Key Michigan Industries

Michigan's road and bridge infrastructure plays an important role in supporting Michigan's economy by lowering the cost of doing business in the state. This section provides a discussion of the role that the state's road infrastructure plays in the cost structure for the manufacturing, agriculture, and tourism industries in the state.

MICHIGAN TOURISM AND ROAD INFRASTRUCTURE

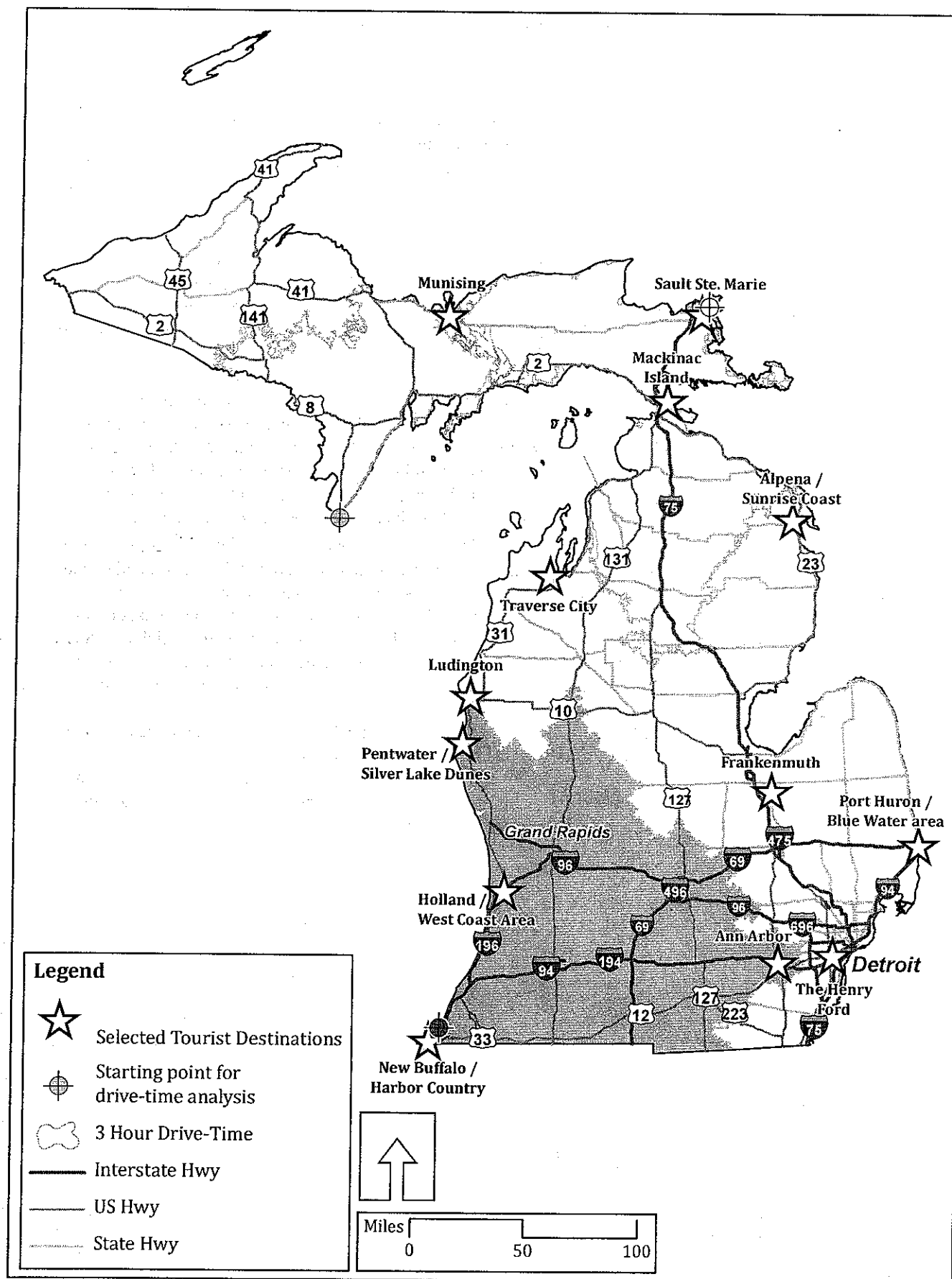
Tourism is perhaps the industry most directly tied to the State of Michigan's natural assets. Tourism is also one of Michigan's important "export" industries, where Michigan's residents gain from out-of-state customers. There are two broad groups of tourists: tourists coming from outside the state, and Michigan residents spending leisure time within Michigan rather than visiting other states. Both of these groups use Michigan's trunkline road system as their principal means of getting to Michigan's many attractive tourist destinations, and will often rely on county and local roads to conveniently access the state trunkline roads.

Figure 5 on page 20 shows several tourist destinations highlighted on the State of Michigan's "Pure Michigan" promotional campaign website, selected for illustrative purposes.¹² This map also shows areas that visitors to Michigan can reach within 2 hours' drive after entering the state at the state's borders with Indiana, Wisconsin, and Ontario at Sault Ste. Marie. As shown in Figure 5, this corridor is served by Interstate 94 and US 31.

A second set of attractions for residents of other states is in the Upper Peninsula, including the Locks and heritage sites at Sault Ste. Marie, lighthouses and sites important to Michigan's shipping heritage, and recreation sites throughout the peninsula, which include large areas of state and national forests. For these sites tourists from outside Michigan rely heavily on US roads 2, 28, and 41, which are the only ways to access these sites other than flying or sailing in on the great lakes.

12. See <http://www.michigan.org/Partners/Default.aspx>

Figure 5: Michigan's Trunkline Road System and Selected Destinations for Residents of Other States



Source: ESRI, Inc. Illustrative examples of tourist destinations selected from "Featured Destinations" section on PureMichigan.org.

As shown in Figure 5 above, visitors to these destinations rely on Michigan's trunkline road system to reach their destinations after crossing into the state. Since many important destinations are within only 3 hours of the state border, delays due to traffic accidents or road bottlenecks can add a significant amount of travel time compared to the traveler's plan.

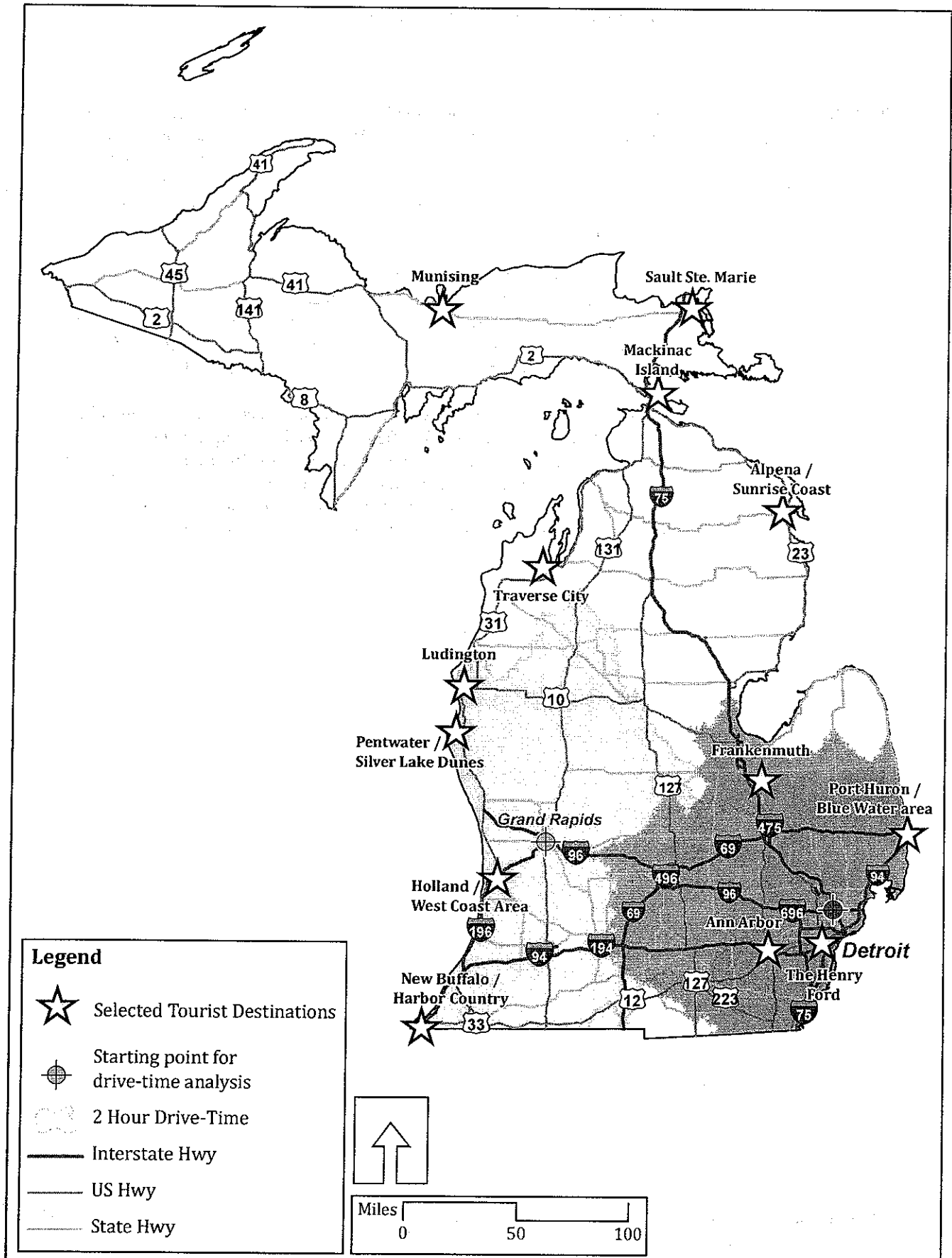
Michigan residents spending leisure and recreation time in the state are another important asset to Michigan's economy. As Michigan residents spend their leisure time within the state rather than visiting neighboring states or destinations further afield, the state's economy benefits—not to mention the benefits our residents gain from having access to these attractions.

Tourism by Michigan residents within the state is year-round and very diverse. It includes visiting the shores of Lake Michigan and Lake Huron, thousands of lake homes, fishing camps, and hunting camps throughout the state, state parks, and historic and heritage tourism locations such as Frankenmuth, The Henry Ford, Sault Ste. Marie, and Michigan's historic light houses. Figure 6 on page 22 shows several tourist destinations highlighted on the State of Michigan's "Pure Michigan" promotional campaign website, selected for illustrative purposes.¹³ This map also shows areas that residents of the Detroit and Grand Rapids population centers can reach within 2 hours' drive, demonstrating that much of Michigan's lower peninsula is accessible within several hours of home for many "down staters." Like residents of other states visiting Michigan, Michigan's residents rely primarily on Michigan's trunkline roads to travel between communities, and count on county and local roads to reach their destinations.

Michigan's trunkline road system is crucial to maintaining and expanding the state's tourism industry for both out of state and internal tourists. Delays on the roads due to accidents from poor road conditions, excess construction stemming from underinvestment, or simple traffic bottlenecks due to capacity constraints, could hinder this important industry.

13. See <http://www.michigan.org/Partners/Default.aspx>

Figure 6: Michigan's Trunkline Road System and Selected Destinations for Michigan Residents



Source: ESRI, Inc. Illustrative examples of tourist destinations selected from "Featured Destinations" section on PureMichigan.org.

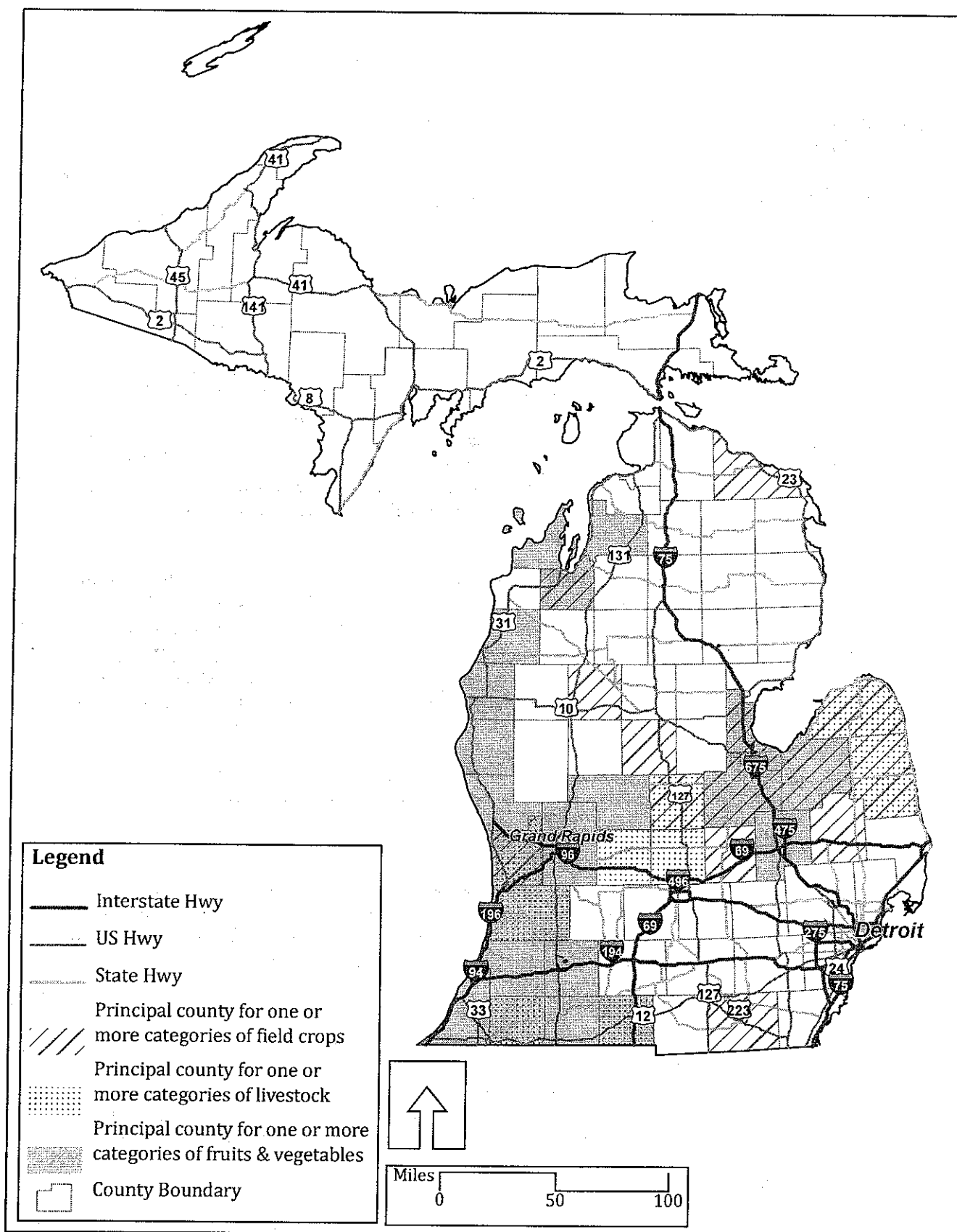
**MICHIGAN
AGRICULTURE AND
ROAD
INFRASTRUCTURE**

Agriculture is another important industry that ties Michigan's economy to the rest of the country. Michigan has over 55,000 farms which had \$6.6 billion in cash receipts in 2008. Michigan ranked first in the nation for 13 agricultural products in 2008, and was in the top 5 in 20 more. Michigan tops the nation in production of fruits like blueberries and tart cherries, but also several flowers, beans, and vegetables.

Michigan's trunkline, county, and local roads are crucial for agricultural products to reach both processors and end customers alike in a timely fashion. While agricultural product producers rely on both rail and trucking, both the time and expense of transporting the products of this extremely competitive market can be significantly affected by the state of our trunkline and local roads.

Figure 7 below shows how Michigan's trunkline system serves the agriculture industry throughout the state. The figure shows the principal counties (i.e. ranked in the top 5 counties in the state) for livestock, fruits and vegetables, and field crops. As shown, the state's non-interstate trunkline roads (including US- and M- designated roads) are important pieces of the transportation infrastructure that serve the state's diverse agricultural products industry.

Figure 7: Michigan's Trunkline Road System and Agricultural Production



Source: ESRI, Inc.; Michigan Agricultural Statistics, 2008-2009, Michigan Department of Agriculture

Note: Categories include each Michigan county that is a top-five producer of a crop within the State of Michigan. Field crops include corn for grain, dry beans, hay, oats, soybeans, sugarbeets, and wheat. Livestock includes cattle and calves, hogs and pigs, and milk cows. Fruits and vegetables include apples, blueberries, grapes, tart cherries, asparagus, cucumber processing, and snap beans processing.

**MICHIGAN
MANUFACTURING
AND ROAD
INFRASTRUCTURE**

Manufacturing is an extremely important sector in Michigan's economy, accounting for almost 16% of employment in the state in 2007 (note that this figure is from before the recent economic downturn nationwide).¹⁴ Even more important is its role as a leading source of the state's exports to the rest of the nation and the world. Most manufacturing sectors in the state are linked to between two and four additional jobs in the state, compared to other industries such as retail and information services that result in around one additional job.¹⁵

Both rail and road transportation are crucial for keeping manufacturing facilities connected with their suppliers and customers, both within the state and across state lines. The importance of connections with suppliers is particularly important for states like Michigan that have "clusters" of manufacturing facilities located near each other, which lowers the cost of producing complex products with thousands of parts, such as automobiles. Such connections between facilities within the region are more likely to count on road transportation than rail. The state's trunkline, county, and local roads are also important for allowing manufacturing facilities to draw their workforces from a broad set of residential areas in the state.

One study of the automotive industry by the Center for Automotive Research focused specifically on automotive parts crossing the state line at the U.S.-Canada border, which connects facilities in Ontario to their counterparts in Michigan, Ohio, Indiana, and other states.¹⁶ This study estimates that, in some situations, multi-facility production is so tightly coordinated that delays at the border crossing (and, it stands to reason, elsewhere on the roads) can cost auto manufacturers \$40,000 to \$140,000 per hour. Most connections between manufacturers and their suppliers and customers have lower stakes than this. Nevertheless, bottlenecks and delays on Michigan's trunkline road system due to excess construction, accidents from poor road conditions, and inadequate capacity could result in persistent cost disadvantages for some manufacturing businesses in the state.

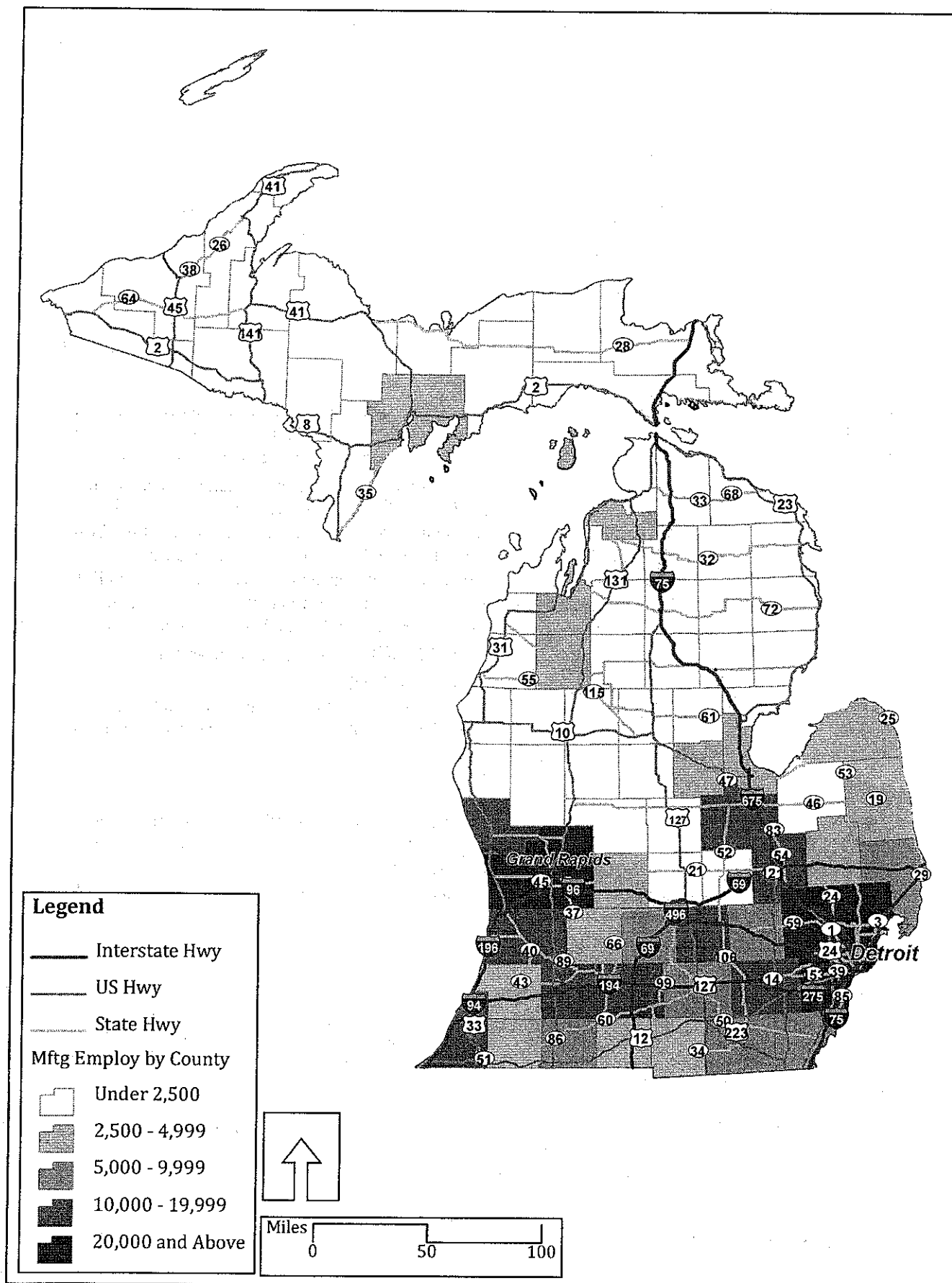
Figure 8 on page 26 shows how manufacturing employment in the State of Michigan is distributed geographically compared to the state trunkline road system. As shown, Michigan's interstate highways are particularly important for connecting the state's most manufacturing-intensive counties to each other and to the state borders.

14. U.S. Census Bureau's County Business Patterns data series.

15. Comparison of "Direct Effect Employment" multipliers for the State of Michigan from the RIMS II multiplier series by the U.S. Bureau of Economic Analysis.

16. David Andrea and Brett Smith, "The Canada-U.S. Border: An Automotive Case Study," Center for Automotive Research, 2002.

Figure 8: Michigan Manufacturing Employment, 2007



Source: ESRI, Inc.; U.S. Census Bureau, County Business Patterns.

V. Road Infrastructure's Impact on Michigan Households

The condition of Michigan's road infrastructure impacts households in other ways too. First, poor road conditions create safety problems for residents when poor roads contribute to accidents or increase the severity of accidents that occur for other reasons. Second, poor road infrastructure reduces the wealth of Michigan residents when poor roads result in vehicle damage, excess fuel use, and time wasted sitting idly in traffic jams. In this section, we discuss the impact that poor road infrastructure has on the safety and wealth of Michigan residents.

IMPACT OF ROAD CONDITIONS ON SAFETY OF RESIDENTS

Road conditions are one factor that contributes to crashes and determines the severity of the crash. A study by the Pacific Institute for Research and Evaluation estimates that road conditions contributed to crash occurrence or severity of one-third of all crashes nationally in 2006.¹⁷ The study defines road conditions as contributing to the crash if one of 22 road factors were present at the time of the crash including: a traffic control device not functioning, congestion, insufficient elevation and drainage of the road, signs missing, and bad lane marking. The study defines road conditions as increasing the severity of the crash if the driver was moderately to fatally injured in a vehicle that hit a large tree or medium or large non-breakaway pole, or if the first harmful event was collision with a bridge.¹⁸ In 2007, over 324,000 crashes occurred in Michigan resulting in 80,576 persons injured and 1,084 fatalities.¹⁹ Applying the Pacific Institute's estimate of the national percentage of crashes involving road conditions to Michigan crashes, road conditions contributed to or increased the severity of 101,791 crashes in Michigan.²⁰

REDUCTIONS IN WEALTH DUE TO POOR ROAD CONDITIONS

Poor road conditions can lead to accidents and traffic jams that waste money and fuel, and result in medical bills and vehicle repairs that otherwise would not be necessary. In this section we look at the cost of medical bills and vehicle repairs in Michigan due to poor road conditions, and then look at the cost of congestion.

17. Crashes were identified as road-related if an occupant was moderately to fatally injured. See Dr. Ted R. Miller and Dr. Eduard Zaloshnja, *On a Crash Course: The Dangers and Health Costs of Deficient Roadways*, A Study by the Pacific Institute for Research and Evaluation, April 2009.

18. Ibid.

19. See *Michigan's Road in Crisis*, A Report of the Highway, Road and Bridge Subcommittee of the Citizens Advisory Committee, July 21, 2008.

20. See "Appendix A. Methodology" for data and calculations.

Reductions in Wealth due to Crashes Involving Road Conditions

Vehicle crashes are costly. Crashes can produce injuries that require medical care, vehicle damage that require repairs, time delays, and productivity and quality of life losses. The Pacific Institute study, *On a Crash Course*, used a detailed national data set of the causes of large truck crashes to model the probability that road conditions contributed to car crashes. Their study assumes that truck crashes have similar causes to other crashes in the United States. The Pacific Institute study also modeled crash costs using several data sets that included medical details of injuries from crashes, the cost of vehicle damage, and travel delay. They also used previous research to model how injuries reduce productivity in the workplace and the household, and resulted in pain and suffering for those individuals. The Pacific Institute researchers then placed a value on the costs of these losses in productivity and quality of life.

For our purposes here, we report the two most tangible reductions in wealth of Michigan households due to crashes that involved poor road infrastructure—medical costs and vehicle repairs. Since placing a value on human suffering and loss of productivity is somewhat controversial, we do not report those costs in this report, but recognize that vehicle crashes do produce quality of life and productivity losses for Michigan residents.

Using the Pacific Institute study's findings, we estimate that the cost of vehicle repairs due to crashes involving poor road infrastructure was \$542 million in Michigan in 2006. Using our 2007 estimate of the number of crashes due to road conditions, the average cost of property damage per crash is \$5,320. The cost of vehicle repairs from a crash is over 7 times greater than the average vehicle maintenance costs of \$700 per year for a medium sedan driven 15,000 miles per year.²¹

Medical costs due to a vehicle crash can often be significant. The Pacific Institute estimates that crashes involving poor road infrastructure resulted in \$383 million in medical costs in 2006. This works out to a cost of \$3,763 in medical costs per crash in Michigan.²²

Reductions in Wealth due to Congestion Costs

Poorly funded and maintained road infrastructure creates congestion in three ways. First, poor road infrastructure can create accidents that would otherwise not occur. Second, roads that are not adequately maintained require more time

21. Annual maintenance costs calculated using AAA Operating costs for a medium sedan. See AAA, *Your Driving Costs*, 2008 Edition for cost inputs.

22. See Dr. Ted R. Miller and Dr. Eduard Zaloshnja, *On a Crash Course: The Dangers and Health Costs of Deficient Roadways*, A Study by the Pacific Institute for Research and Evaluation, April 2009.

and money when they are fixed.²³ Finally, poor road infrastructure that results in too few lanes to support traffic during peak travel times waste drivers' time and money as they sit idly in traffic jams.

The Texas Transportation Institute (TTI) conducts an annual study of the cost of congestion in urban areas. This study, the *Urban Mobility Report*, includes data for two of Michigan's metropolitan areas: Detroit and Grand Rapids. Almost half (46%) of the state's population lives in the Detroit and Grand Rapids metropolitan areas. Looking at these two areas provides a good indication of the cost of traffic congestion in the state. As shown in the table below, TTI estimates that congestion cost state residents driving in the Detroit area over \$2.4 billion and residents driving in the Grand Rapids area \$148 million in 2007.

TABLE 8. Cost of Congestion in Detroit and Grand Rapids, 2007

	Detroit	Grand Rapids
<i>Inputs</i>		
Population	4,050,000	600,000
Peak Number of Travelers	2,268,000	330,000
Excess Fuel Consumed (Gallons)	76,425,000	4,335,000
Fuel Cost per Gallon	\$3.06	\$3.06
Total Delay (Number of Person Hours)	116,981,000	7,324,000
Commercial Cost of Delay per Hour (Time and Fuel Costs)	\$102.12	\$102.12
Passenger Cost of Delay per Hour	\$15.47	\$15.47
<i>Congestion Cost Measure</i>		
Total Cost from Delay and Excess Fuel Consumed (millions)	\$2,472	\$148

Source: Texas Transportation Institute Urban Mobility Report 2009; Note 2007 data
Analysis: Anderson Economic Group, LLC

Applying some of the parameters from the TTI study to the entire state, we estimate that the cost of congestion (both fuel costs and the value of time wasted) for the remaining areas of Michigan was \$262.3 million in 2007. The cost of congestion in the remaining areas of the state is 10% of the combined cost for Detroit and Grand Rapids. Adding in the rest of the state brings the total cost of

23. See *Pavement Preservation: Applied Asset Management*, National Center for Pavement Preservation, MSU, November 2006. Cost effectiveness data from the Michigan Department of Transportation show that preventative maintenance treatments that maintain and extend the life of the road are less expensive than reconstruction.

congestion in Michigan to \$2.9 billion in 2007 or \$287 per person as shown in Table 9 below.

TABLE 9. AEG Estimate of Total Cost of Congestion in Michigan, 2007

	Cost (millions)
TTI Estimate of Cost of Congestion for Detroit and Grand Rapids	\$2,620
AEG Estimate of Cost of Congestion for Remaining Urban Areas	\$250
AEG Estimate of Cost of Congestion for Remaining Rural Areas	<u>\$12</u>
Total Cost of Congestion for the State of Michigan	\$2,882
<i>Memo:</i>	
<i>Cost of Congestion per Person</i>	<i>\$287</i>

Source: Texas Transportation Institute Urban Mobility Report 2009

Analysis: Anderson Economic Group, LLC

See "Appendix A. Methodology" for our complete methodology for cost estimates reported in this section.

Appendix A. Methodology

ECONOMIC IMPACT OF ROAD CONSTRUCTION

In “Economic Impact of Road Construction” on page 15, we estimate the economic impact of two road construction and maintenance funding scenarios compared to a baseline. This section defines “net impact” and describes the methodology used to complete this analysis.

Net Impact Defined

Net economic impact is the additional economic activity caused by transportation construction and maintenance activity. A *net* measure of economic impact must take into account potential alternative uses for the money spent on infrastructure investment so that only *bona fide* new economic activity is counted.

This *net* employment impact analysis quantifies the direct and indirect employment impact of road construction and maintenance net of any foregone employment in other parts of the economy due to taxes and fees used to fund the Michigan Transportation Fund (MTF). Any proper economic impact analysis must properly account for both the costs and benefits, including the costs and benefits from taxpayers substituting tax payments for other expenditures.

This report accounts for substitution. The levels of investment in Michigan’s road infrastructure (detailed below) assume different levels of funding of the MTF. Since the MTF is funded primarily through vehicle registrations and per-gallon taxes on diesel fuel and gasoline, variations in funding could occur through a combination of several factors. These factors include changes in behavior, such as more miles driven or more vehicles registered by Michigan’s citizens and visitors, and policy changes, such as an increase in vehicle registration fees or taxes on fuel. Accounting for substitution requires that this analysis acknowledge that money not spent on taxes and fees funding the MTF would otherwise have been spent elsewhere, potentially supporting employment in Michigan. However, MTF revenue coming from out of state residents and businesses, and federal funding, are not subject to the same type of substitution analysis since their spending would otherwise occur outside of Michigan.

Economic Impact Analysis

To estimate the employment impact of Michigan Transportation Fund funding scenarios we used the following methodology:

1. We identified the FY 2011 MTF funding levels associated with the “Do Nothing,” “Baseline,” and “Bold Action” scenarios. The “Do Nothing” funding level is the MTF funding level associated with extending current law, as forecast by MDOT in communications with our firm in January 2010. It is within about 5% of the MTF funding level associated with the budget proposal released by Governor Granholm in February of 2010. The “Baseline” funding scenario is the MTF funding level required to match all federal funds Michigan is eligible for under SAFETEA-LU, as estimated by MDOT in communications with AEG.

The "Bold Action" scenario simply doubles the "Baseline" MTF funding level, which is close to the "Better" funding scenario laid out in the Transportation Funding Task Force report of 2008. See Table A-1 in Appendix A.

2. We estimated the proportion of the MTF that would be allocated to the State Trunkline Fund, County Road Commissions, and Cities and Villages using State of Michigan House Fiscal Agency records of MTF allocations from 1998 to 2007. We also assumed that 90% of these funds are used to construct, maintain, and preserve roads (with the remainder used on other infrastructure projects and administration) based on communications with MDOT officials. See Table A-1 in Appendix A.
3. We identified difference in federal funds used for Michigan road construction projects under each MTF funding level, taking into account that federal funding requires "matching" funds to be allocated to projects by state and local governments. We assumed that the amount that would be forfeited under the "Do Nothing" scenario is \$475 million based on an estimated by MDOT in communications with AEG. See Table A-1 in Appendix A.
4. We identified the difference in MTF and federal funding for state and local road projects compared to the "Baseline" level for the "Do Nothing" and "Bold Action" scenarios. We estimated the proportion of funds that otherwise would have been spent in the state by households and businesses, and the proportion otherwise spent outside Michigan, using professional judgement. See Table A-2 in Appendix A.
5. We estimated the direct and indirect employment associated with construction spending, spending by households, and spending by businesses using multipliers supplied by the Bureau of Economic Analysis's RIMS II Input-Output multiplier series. The "Final Demand Employment" multipliers from this series provide an estimate of the total number of jobs created by each additional \$1 million spent in specific industries in Michigan. We evaluated spending by Michigan households using the "Households" industry multiplier. We evaluated spending by Michigan businesses using the "Truck Transportation" industry multiplier. We evaluated spending on road construction and maintenance using the "Construction" industry multiplier. While this multiplier is not specific to road construction, our judgement is that this multiplier is representative of the road construction industry, which operates on a similar scale and is similarly labor-intensive compared with other types of construction. See Tables A-3 and A-4 in Appendix A.
6. We estimated the total net employment impact by summing the employment impacts of road construction and changes in MTF funding sources (fuel taxes and motor vehicle fees), whose effects oppose each other in both the "Do Nothing" and "Bold Action" scenarios.

Limitations and Cautions

The employment impact analysis finds a strong result in favor of using increased MTF funds for road construction, even without quantifying the economic benefits of having improved road infrastructure. This result relies primarily on two aspects of the analysis. First, construction is an activity that has a higher economic multiplier than does the alternative spending by households

and businesses. Second, a portion of the funds that go to the MTF through motor fuel taxes and motor vehicle registration fees would otherwise be spent outside the state by businesses and individuals. This logic would appear to apply to many forms of state government spending paid for by taxes, and indeed it may. Nevertheless, there are several aspects of road construction in particular that may not apply to other, apparently analogous proposals for tax-funded expenditures, including transportation-related proposals.

- First, funding for the construction and maintenance of Michigan's road infrastructure has constitutional, statutory, and precedential protections that should give Michigan's citizens great confidence that the money allocated to the MTF is spent as intended.
- Second, road construction and maintenance applies to an existing, mature transportation network that has predictable costs and proven patterns of use. This might not be the case for proposals to construct entirely new transportation systems in the state.
- Third, the state's road system (especially the trunkline roads) support rather than disrupt existing commerce. Some other proposals for increased government spending would have neutral or even negative effects on commerce in the state.

Table A-1: Michigan Transportation Fund, Three Possible Funding Levels for FY 2010-11

	<u>Note</u>	<u>Do Nothing</u>	<u>Baseline</u>	<u>Bold Action</u>
MTF, State-Sources and Federal Revenue Scenarios				
Total MTF Revenue*	(1)	\$ 1,849.7	\$ 2,188.6	\$ 4,377.1
Allocation of MTF Revenue Among Road Agencies				
Proportion going to State Trunkline Fund	(2)	35.0%	35.0%	35.0%
Proportion going to County Road Commissions	(3)	31.6%	31.6%	31.6%
Proportion going to Cities and Villages	(4)	18.0%	18.0%	18.0%
<i>memo: Total Proportion going to Road Agencies</i>	(5)	84.6%	84.6%	84.6%
Proportion of funds used to construct, maintain, and preserve roads	(6)	90%	90%	90%
MTF Revenue to Road Agencies used to construct, maintain, and preserve roads				
State Trunkline Fund expenditures on construction and maintenance		\$ 582.66	\$ 689.40	\$ 1,378.80
County Road Commission expenditures on construction and maintenance		\$ 526.05	\$ 622.43	\$ 1,244.86
Cities and Villages expenditures on construction and maintenance		\$ 299.65	\$ 354.55	\$ 709.10
Subtotal: MTF funds to road agencies used to construct and maintain roads.	(7)	\$ 1,408.36	\$ 1,666.38	\$ 3,332.75
<i>memo: MTF revenue not allocated to road agencies, or used by road agencies for purposes other than constructing, maintaining, and preserving roads</i>		\$ 441.34	\$ 522.19	\$ 1,044.39
At-Risk Federal Revenue Scenarios				
"At Risk" Federal Funding (Only Available if Matched by State Funds)	(8)	\$ -	\$ 475.00	\$ 475.00
Summary: Total MTF Allocation to Road Agencies Spent on Roads and At Risk Federal Funds				
MTF funds to road agencies used to construct and maintain roads.		\$ 1,408.36	\$ 1,666.38	\$ 3,332.75
"At Risk" Federal Funding (Only Available if Matched by State Funds)		\$ -	\$ 475.00	\$ 475.00
Total - MTF Revenue and "At Risk" Federal Funds		\$ 1,408.36	\$ 2,141.38	\$ 3,807.75

Notes:

* All dollar figures in millions of dollars.

- (1) "Do Nothing" and "Baseline" MTF revenue are from MDOT estimates of current law and the funding amount required to match federal aid for the State Trunkline Fund. MDOT estimates provided to AEG in January of 2010. "Bold Action" scenario based on relative funding level in the "Better" scenario in the 2008 Transportation Funding Task Force report, which assumes state and local funds for Highway Road and Bridge investments at over twice the amount in the "Good" investment scenario defined by that report. See Transportation Funding Task Force report, Figure A.
- (2) AEG analysis of MTF Revenues and Distributions from Michigan House Fiscal Agency records. Figure is average road agency distribution as a percentage of total MTF revenue between FY 1998-99 and 2007-08.
- (3) AEG analysis of MTF Revenues and Distributions from Michigan House Fiscal Agency records. Figure is average road agency distribution as a percentage of total MTF revenue between FY 1998-99 and 2007-08.
- (4) AEG analysis of MTF Revenues and Distributions from Michigan House Fiscal Agency records. Figure is average road agency distribution as a percentage of total MTF revenue between FY 1998-99 and 2007-08.
- (5) AEG analysis of MTF Revenues and Distributions from Michigan House Fiscal Agency records. MTF Revenues not going to road agencies goes to administration, debt service, and earmarks for other purposes such as recreation and bridges.
- (6) According to MDOT, approximately 90% of funds to the State Trunkline Fund are used to construct, maintain, and preserve roads. This analysis assumes that this proportion is also true for the other road agencies that are allocated MTF funds: county road commissions and cities and villages.
- (7) Totals in this line reflect MTF funds that are allocated to road agencies (see note 5), and the proportion these funds that road agencies spend on construction, maintenance, and preservation of roads (see note 6).
- (8) Estimate of lost federal funds due to projected revenue shortfall from MDOT, provided to AEG in January of 2010. "Bold Action" scenario assumes increased funding from state sources, but would not garner additional transportation funds from the federal government, which are at their maximum level in the "Baseline" scenario.

Table A-2: Alternative Uses of MTF Funding by Households and Business

Counterfactual Allocation of MTF Funds - Comparison to "Baseline" Funding Level	Note	Do Nothing	Baseline	Bold Action
Total MTF Revenue*	(1) (2)	\$ 1,849.70	\$ 2,188.57	\$ 4,377.14
MTF Revenue - Increment compared to "Baseline" funding level				
Otherwise Spent in Michigan by Households	(3) x 65%	\$ (338.87)	\$ -	\$ 2,188.57
Otherwise Spent in Michigan by Business	(3) x 20%	\$ (220.27)	\$ -	\$ 1,422.57
Otherwise Spent Outside Michigan	(3) x 15%	\$ (67.77)	\$ -	\$ 437.71
		\$ (50.83)	\$ -	\$ 328.29
Road Agency Expenditures of MTF Funds on Roads - Comparison to "Baseline" Funding Level				
State Trunkline Fund expenditures on construction and maintenance	(2)	\$ 582.66	\$ 689.40	\$ 1,378.80
County Road Commission expenditures on construction and maintenance	(2)	\$ 526.05	\$ 622.43	\$ 1,244.86
Cities and Villages expenditures on construction and maintenance	(2)	\$ 299.65	\$ 354.55	\$ 709.10
memo: MTF revenue not allocated to road agencies, or used by road agencies for purposes other than constructing, maintaining, and preserving roads	(2)	\$ 441.34	\$ 522.19	\$ 1,044.39
State Trunkline Fund - Increment compared to "Baseline" funding level		\$ (106.74)	\$ -	\$ 689.40
County Road Commissions - Increment compared to "Baseline" funding level		\$ (96.37)	\$ -	\$ 622.43
Cities and Villages - Increment compared to "Baseline" funding level		\$ (54.90)	\$ -	\$ 354.55
memo: MTF revenue not allocated to road agencies, or used by road agencies for purposes other than constructing, maintaining, and preserving roads - Increment compared to "Baseline" funding level		\$ (80.85)	\$ -	\$ 522.19
At Risk Federal Funds - Comparison to "Baseline" Funding Level				
"At Risk" Federal Funding (Only Available if Matched by State Funds)	(2)	\$ -	\$ 475.00	\$ 475.00
"At Risk" Federal Funding (Only Available if Matched by State Funds)		\$ (475.00)	\$ -	\$ -

Notes:

* All dollar figures in millions of dollars.

(1) This section describes what we assume "would have happened" to MTF funding if the associated taxes and fees were not levied. This analysis assumes all revenue to road agencies came from the combination of gas and diesel taxes and motor vehicle registration and title fees. These sources made up 99.2% of MTF revenue between FY 1998-99 and 2007-08. Data source is AEG's analysis of MTF Revenues and Distributions from Michigan House Fiscal Agency records.

(2) See Table 1

(3) Proportion otherwise spent in Michigan by households and businesses, and outside Michigan. Estimated by AEG using professional judgment.

Table A-3: Employment Impact of "Doing Nothing" Scenario

Scenario: "Do nothing," failing to achieve funding level required to match federal funds; give up federal funding

	Impact of "Doing Nothing" Compared to "Baseline"	Employment Multipliers (Employment per \$1 million in spending) ^a	Employment Impact of Changes in Spending ^b
MTF Revenues from Taxes and Fees - Increment Above (Below) "Baseline" Scenario (From Table 2)			
Otherwise Spent In Michigan by Households	\$ 220.27 x	12.9818	= 2,859
Otherwise Spent in Michigan by Business	\$ 67.77 x	15.9463	= 1,081
Otherwise Spent Outside Michigan	\$ 50.83 x	0	= -
Subtotal: Impact of Lower Taxes and Fees			3,940
MTF Spending on Road Construction and Maintenance, Increment Above (Below) "Baseline" Scenario (From Table 2)			
State Trunkline Fund expenditures on construction and maintenance	\$ (106.74) x	20.7418	= (2,214)
County Road Commission expenditures on construction and maintenance	\$ (96.37) x	20.7418	= (1,999)
Cities and Villages expenditures on construction and maintenance	\$ (54.90) x	20.7418	= (1,139)
Subtotal: Impact of MTF-Funded Road Expenditures			(5,352)
Federal Spending on Road Construction and Maintenance, Increment Above (Below) "Baseline" Scenario (From Table 2)			
"At Risk" Federal Funding Forgone	\$ (475.00) x	20.7418	= (9,852)
Subtotal: Impact of Federally-Funded Road Expenditures			(9,852)
MTF Spending Other Than Road Construction, Increment Above (Below) "Baseline" Scenario (From Table 2)			
MTF revenue not allocated to road agencies, or used by road agencies for purposes other than constructing, maintaining, and preserving roads	\$ (80.85) x	11.62743	= (940)
Subtotal: Impact of Non-Construction MTF Expenditures			(940)
Total Impact on Michigan Employment From Changes in Private Spending and Road Investment			(12,204)

Notes:

- (a) Economic impact multipliers from U.S. Commerce Department's RIMS II Input-Output multiplier series for Michigan, 2006. Multipliers are specific to household spending and construction industries. Michigan business spending is otherwise assumed to be spent in the "Truck Transportation" industry since much of business's contribution to the MTF is through the per-gallon gasoline and diesel fuel taxes. MTF revenue not allocated to road agencies is assumed to have a multiplier equal to a blended average of the household and business spending multipliers applied to the MTF revenues from taxes and fees; this is, in effect, an assumption that spending on administration and other uses of MTF funds are neutral compared to MTF-funding taxes and fees in terms of employment impact.
- (b) Change in employment reflects direct and indirect employment caused by changes in spending by Michigan households, businesses, and the state government.

Table A-4: Employment Impact of "Bold Action" Scenario

Scenario: Take "Bold Action," funding road infrastructure beyond level required to match federal funds.

	Impact of "Bold Action" compared to "Baseline"	Employment Multipliers (Employment per \$1 million in spending) ^a	Employment Impact of Changes in Spending ^b
MTF Revenues from Taxes and Fees - Increment Above (Below) "Baseline" Scenario (From Table 2)			
Otherwise Spent In Michigan by Households	\$ (1,422.57) x	12.9818	= (18,468)
Otherwise Spent in Michigan by Business	\$ (437.71) x	15.9463	= (6,980)
Otherwise Spent Outside Michigan	\$ (328.29) x	0	=
Subtotal: Impact of Higher Taxes and Fees			(25,447)
MTF Spending on Road Construction and Maintenance, Increment Above (Below) "Baseline" Scenario (From Table 2)			
State Trunkline Fund expenditures on construction and maintenance	\$ 689.40 x	20.7418	= 14,299
County Road Commission expenditures on construction and maintenance	\$ 622.43 x	20.7418	= 12,910
Cities and Villages expenditures on construction and maintenance	\$ 354.55 x	20.7418	= 7,354
Subtotal: Impact of MTF-Funded Road Expenditures			34,564
Federal Spending on Road Construction and Maintenance, Increment Above (Below) "Baseline" Scenario (From Table 2)			
"At Risk" Federal Funding Forgone	\$ - x	20.7418	= -
Subtotal: Impact of Federally-Funded Road Expenditures			
MTF Spending Other Than Road Construction, Increment Above (Below) "Baseline" Scenario (From Table 2)			
MTF revenue not allocated to road agencies, or used by road agencies for purposes other than constructing, maintaining, and preserving roads	\$ 522.19 x	11.62743	= 6,072
Subtotal: Impact of Non-Construction MTF Expenditures			6,072
Total Impact on Michigan Employment From Changes in Private Spending and Road Investment			15,188

Notes:

- (a) Economic impact multipliers from U.S. Commerce Department's RIMS II Input-Output multiplier series for Michigan, 2006. Multipliers are specific to household spending and construction industries. Michigan business spending is otherwise assumed to be spent in the "Truck Transportation" industry since much of business's contribution to the MTF is through the per-gallon gasoline and diesel fuel taxes. MTF revenue not allocated to road agencies is assumed to have a multiplier equal to a blended average of the household and business spending multipliers applied to the MTF revenues from taxes and fees; this is, in effect, an assumption that spending on administration and other uses of MTF funds are neutral compared to MTF-funding taxes and fees in terms of employment impact.
- (b) Change in employment reflects direct and indirect employment caused by changes in spending by Michigan households, businesses, and the state government.

ROAD INFRASTRUCTURE'S IMPACT ON MICHIGAN HOUSEHOLDS

In "Impact of Road Conditions on Safety of Residents" on page 27 and "Reductions in Wealth due to Poor Road Conditions" on page 27, we present statistics on crashes where road conditions were involved and our estimates of the cost impact on Michigan households. In Table A-5 below, we provide the sources and calculations for data presented in those sections.

TABLE A-5. Data and Calculations for Household Impact Analysis

Category	Input	Data Source
Percentage of Road Crashes Where Road Conditions Contributed	31.4%	Pacific Institute, "On a Crash Course"
Number of Crashes in Michigan, 2007	324,174	CAC, "Michigan Roads in Crisis"
Number of Crashes in Michigan due to Road Conditions, 2007	101,791	AEG Calculation
Total "Other Costs" of Crashes due to Road Conditions in U.S., 2006	\$51.9 billion	Pacific Institute, "On a Crash Course"
Property Damage in Crashes due to Road Conditions in U.S., 2006	\$24.7 billion	Pacific Institute, "On a Crash Course"
Property Damage / Total Other Costs	47.6%	AEG Calculation
Michigan Total Other Costs, 2006	\$1.1 billion	Pacific Institute, "On a Crash Course"
MI Property Damage from Crashes due to Road Conditions, 2006	\$542 million	AEG Calculation
MI Medical Costs from Road Crashes due to Road Conditions, 2006	\$383 million	Pacific Institute, "On a Crash Course"
Medical Costs per Crash due to Road Conditions in MI	\$3,763	AEG Calculation
Property Damage Costs per Crash due to Road Conditions in MI	\$5,320	AEG Calculation
AAA Operating Costs per Mile, Medium Sedan	\$0.047	AAA, "Your Driving Costs," 2008
Average Number of Miles Driven per Year	15,000	AAA, "Your Driving Costs," 2008
Average Annual Cost of Maintenance for Medium Sedan	\$701	AEG Calculation

Source: Anderson Economic Group, LLC

To estimate the state-wide cost of congestion (time and fuel wasted) we used the following methodology:

1. We started with the Texas Transportation Institute's *Urban Mobility Report 2009* estimate of the cost of congestion for the Detroit and Grand Rapids metropolitan areas. 46% of the state's population lives in these two areas. The TTI study estimates that the cost of congestion for these two urban areas was \$2.6 billion in 2007.
2. To estimate the congestion costs for the remaining parts of the state, we first divided the state's population into rural and urban populations. Using the Federal Highway Administration's 2007 data, we estimated that 7.5 million residents live in urban areas (74.8% of the state's population) and 2.5 million live in rural areas. After subtracting the population living in Grand Rapids and Detroit, we estimated that 2.8 million residents live in urban areas outside these two metropolitan, and 2.5 million residents live in rural areas.
3. We then estimated the percentage of these residents affected by congestion. We estimated that 20% of those living in the remaining urban areas would be affected by congestion and only 10% in rural areas. We selected 20% for the other urban areas of the state because it was similar to the percentage of the population affected by congestion in small urban areas reported in the TTI study.

Appendix A. Methodology

We selected 10% for rural areas based on the percentage of rural interstate roads affected by congestion calculated by the Federal Highway Administration (see Table 8 on page 29).

4. Next we calculated the total hours of delay due to congestion. We used the TTI study's average annual delay per affected traveler for small urban areas for the remaining urban parts of the state. The annual delay is 19 hours per traveler. For rural areas we used 10% (1.9 hours). Multiplying the number of travelers by the annual delay per traveler resulted in 10.8 million hours of delay for residents living in the remaining urban areas of the state and 480 thousand hours of delay for residents living in rural areas.
5. Next we calculated the amount of excess fuel consumed by drivers sitting in traffic. We multiplied the number of travelers affected for each area by the annual wasted fuel per peak traveler affected. For the urban areas we used 11 gallons of fuel per traveler, which is the average for small urban areas in the TTI study. We used 10% of this amount for rural areas (1.1 gallons).
6. We divided travelers into two categories: truck and passenger. To calculate the cost of congestion for truck traffic in urban areas we multiplied the percentage of truck traffic in urban areas (7%) reported by the Federal Highway Administration's Highway Statistics 2007 by the total hours of delay in urban areas (10.8 million hours) by \$102.12, which is TTI's estimate of the value of time and excess fuel costs for truck traffic. We did the same calculation for rural areas. The percentage of truck traffic in rural areas used was 9.5%. We estimate that the total cost of congestion (time and fuel) for truck traffic in the remaining areas of the state outside Grand Rapids and Detroit is \$82 million.
7. To calculate the cost of congestion for passengers we did two calculations: one for the cost of excess fuel consumed and one for the value of wasted time. To calculate the cost of excess fuel consumed we multiplied the percentage of fuel consumed in Michigan that was gasoline (82%) by our estimate of the gallons of excess fuel consumed (6.6 gallons for both rural and urban areas) by \$3.06, which is the cost per gallon of fuel used in the TTI study. Next, we calculated the value of time by multiplying the total hours of delay by the percentage that is non-truck delay (93% for remaining urban areas and 90.5% for rural areas) by \$15.47, which is the value of passenger time (or opportunity cost) used in the TTI study. We used the same fuel and hourly value of time as the TTI study to ensure that our estimates for the remaining parts of the state were consistent with TTI's estimates for Grand Rapids and Detroit.
8. We added the cost of congestion for the remaining parts of the state (\$262 million) to the \$2.6 billion cost for Detroit and Grand Rapids to arrive at our total cost of congestion estimate for the state of \$2.9 billion.

Appendix B: About the Authors

This project was completed under the direction of Patrick L. Anderson, Principal and CEO of Anderson Economic Group, LLC. Alex L. Rosaen, a consultant in the firm's public policy, fiscal, and economic analysis practice area, managed the project and co-authored the report with Caroline M. Sallee, Consultant and Justin Eli, Senior Analyst. Brief biographical information of the project team follows.

ALEX L. ROSAEN

Mr. Rosaen is a consultant at Anderson Economic Group, working in the Public Policy and Economics practice area. Mr. Rosaen's background is in applied economics and public finance.

Prior to joining Anderson Economic Group, Mr. Rosaen worked for the Office of Retirement Services (part of the Michigan Department of Management and Budget) for the Benefit Plan Design group. He also has worked as a mechanical engineer for Williams International in Walled Lake, MI.

Mr. Rosaen holds a master's in public policy from the Gerald R. Ford School of Public Policy at the University of Michigan. He also has a Master of Science degree and a Bachelor of Science degree in mechanical engineering from the University of Michigan.

CAROLINE M. SALLEE

Ms. Sallee is a consultant and director of the Chicago office at Anderson Economic Group, working in the Public Policy, Fiscal, and Economic Analysis practice area. Ms. Sallee's background is in applied economics and public finance.

Ms. Sallee is the primary author of the *Annual Economic Impact Reports* for Michigan's University Research Corridor. Her recent work includes fiscal and economic impact studies for Michigan State University and Wayne State University, and the benchmarking of Michigan's business taxes with other states in a project for the Michigan House of Representatives. She also completed a project for Pulse Canada estimating the cost to the pulse industry of labor strikes in the rail transportation sector.

Prior to joining Anderson Economic Group, Ms. Sallee worked for the U.S. Government Accountability Office (GAO) as a member of the Education, Workforce and Income Security team. She also has worked as a market analyst for Hábitus, a market research firm in Quito, Ecuador and as a legislative assistant for two U.S. Representatives.

Ms. Sallee holds a master's degree in public policy from the Gerald R. Ford School of Public Policy at the University of Michigan and a Bachelor of Arts degree in economics and history from Augustana College.

JUSTIN ELI

Mr. Eli is a senior analyst in the finance and business Valuation and public policy practice areas. His work includes economic and financial analyses, and strategy consulting.

His recent work includes an industry review of the U.S. beer market, an analysis of changes in the U.S. automotive industry, an economic impact assessment for Michigan's University Research Corridor, and the cost impact of proposed climate change policies on Michigan's economy. He also contributed to the book *Applied Game Theory and Strategic Behavior*, published in July 2009 by CRC Press.

Prior to joining AEG, Mr. Eli was a financial analyst at Macy's Inc. developing and implementing short and long term strategies for driving sales. In 2008, Mr. Eli received an award from the senior vice-president and director of planning for outstanding achievement and success in strategic planning of fourth-quarter sales.

Mr. Eli holds a B.A. in Economics from the University of Michigan.